TISA Working Group Report

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CERES Science Team Meeting

26-28 April, 2016, NASA-Langley, Hampton, VA

Outline

- Introduction to TISA
- GEO calibration
- GEO image quality control
- SW Narrowband to Broadband for Edition 5
- TISA product schedule
  - Cldtyphist Delivery and Validation
- TISA future
- TISA papers
  - D.R. Doelling, M. Sun, L.T. Nguyen, M.L. Nordeen, C.O. Haney, D.F. Keyes, P.E. Mlynczak, 2016, Advances in Geostationary-Derived Longwave Fluxes for the CERES Synoptic (SYN1deg) Product, *J. Atmos. Oceanic Technol*. Vol. 33, March 2016: 503-521, DOI: 10.1175/JTECH-D-15-0147.1
  - Scarino, B. R., D. R. Doelling, P. Minnis, A. Gopalan, T. Chee, R. Bhatt, C. Lukashin, An Online Interface for Calculating Spectral Band Adjustment Factors Derived from SCIAMACHY Hyper-spectral Data, *IEEE Trans. Geosci. Remote Sens*., Vol. 54, No. 5, 2529-2542, doi: 10.1109/TGRS. 2015.2502904

INTRODUCTION

Introduction

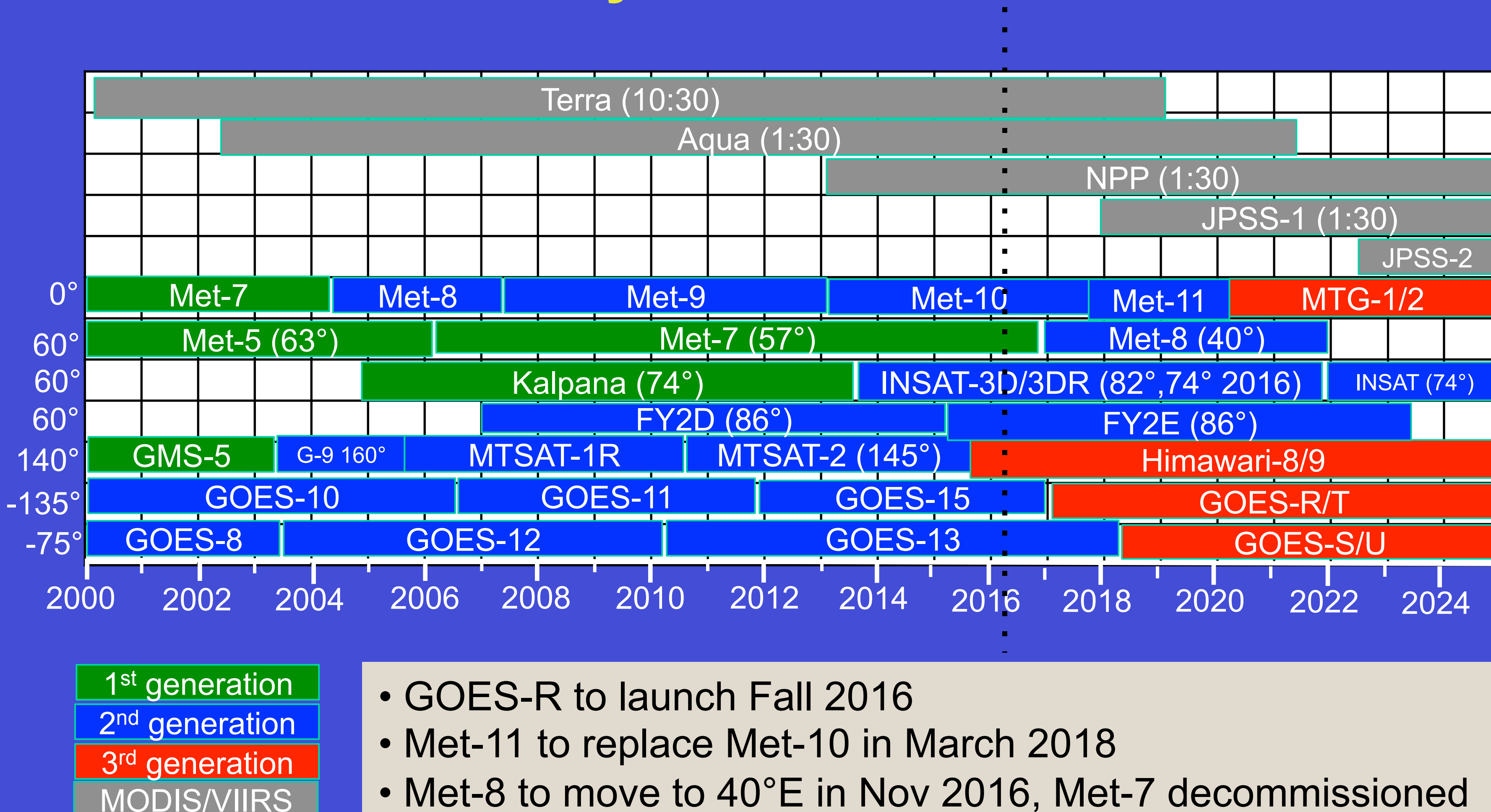
- CERES is onboard the Terra (10:30 AM local equator crossing time), Aqua (1:30 PM), and NPP (1:30 PM) platforms
- The CERES 20-km nominal footprint fluxes are instantaneously averaged in 1° by 1° regions
  - The CERES footprint radiances are converted to fluxes using the CERES ADMs based on imager cloud properties and GMAO MERRA atmosphere
- The regional diurnal flux in between CERES measurements needs to be estimated to derive accurate daily mean fluxes
- The daily regional fluxes are then spatially and temporally averaged into CERES level 3 products
  - To produce monthly global, zonal, and regional fluxes over the 15-year CERES record

CERES level 3 data products

- **SSF1deg**, assumes constant or linear changing meteorology between CERES measurements to model the diurnal cycle
  - Single satellite products
- **SYN1deg**, uses geostationary derived broadband fluxes between CERES observations to model the diurnal cycle
  - Terra+Aqua+NPP product
- **EBAF-TOA**, combines the stability of the SSF1deg product and the accuracy of the regional daily flux means of the SYN1deg product and removes all known flux biases
  - The TOA net flux is constrained to the ocean heat storage
  - The clear-sky fluxes are spatially complete, by computing sub-footprint clear-sky fluxes using the MODIS pixel radiances
  - This product allows climate modelers to validate their fluxes with CERES

GEO CALIBRATION

Geostationary Satellite Time Series



- GOES-R to launch Fall 2016
- Met-11 to replace Met-10 in March 2018
- Met-8 to move to 40°E in Nov 2016, Met-7 decommissioned
- INSAT-3D, still working with McIDAS for IR calibration block
- Himawari-8 calibrated, awaiting cloud code
- MTSAT-2 decommissioned in Dec 4, 2015

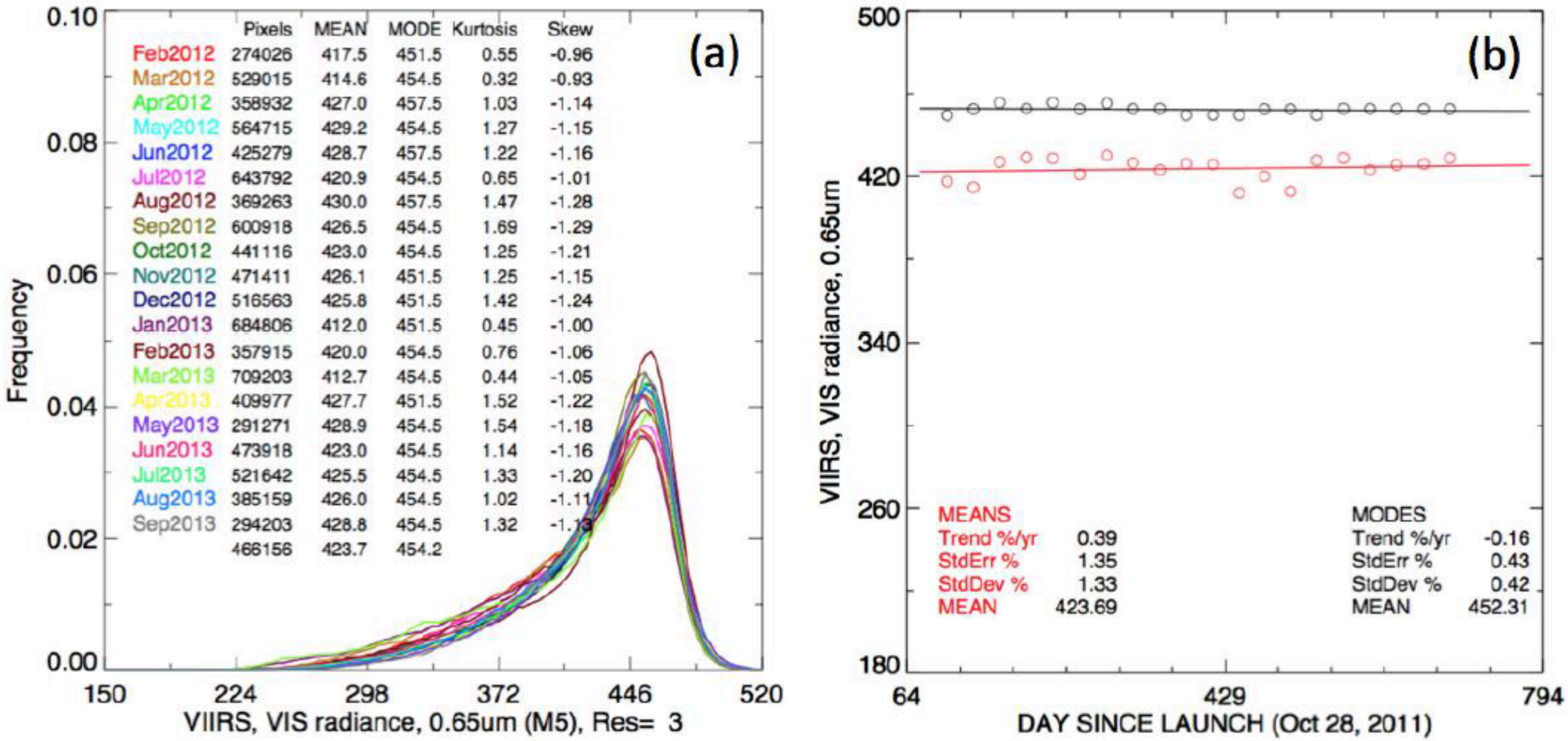
DCC as Earth Invariant Targets

- DCC are bright tropical at tropopause level clouds offering the brightest earth invariant targets
  - Found over all GEO and LEO satellite domains
  - Optically thick clouds found over both land and water with no surface radiation contribution at cloud top
  - Easily identifiable using an IR window channel temperatures threshold, good visible and IR co-registration required
  - DCC are dynamic targets and occur ~0.5% over the tropics, good sensor pointing not required
- Small spectral band adjustments to transfer the calibration of one sensor to another
  - Little water vapor and atmospheric absorption above the tropopause
  - DCC are spectrally flat for wavelengths less than 1 µm
- DCC calibration is a large ensemble statistical approach
  - Near Lambertian solar diffusers
  - Slight regional (land/ocean), diurnal, seasonal and inter-annual DCC reflectance variations

DCC Invariant target methodology

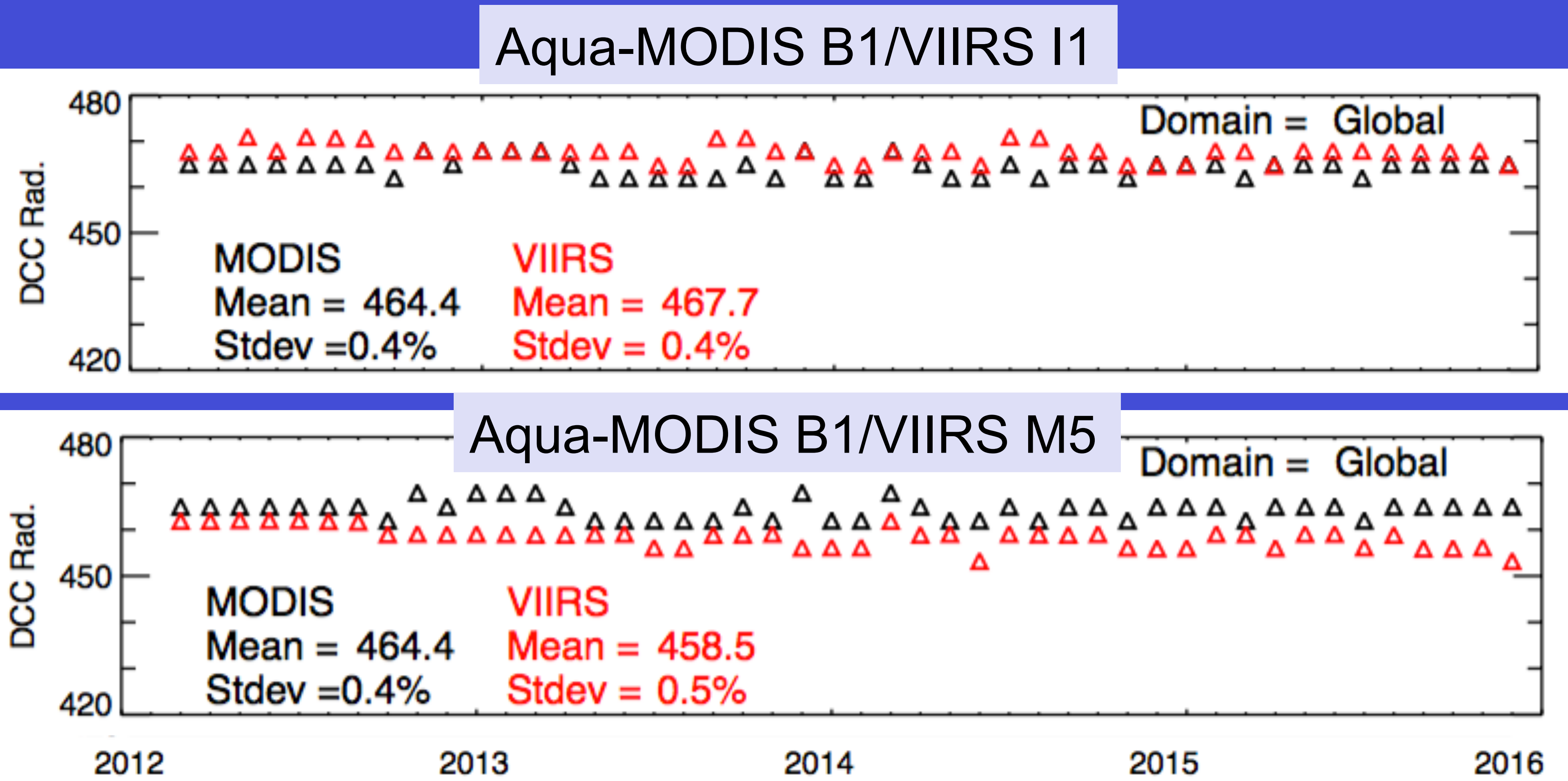
- Identify monthly all DCC pixels over the domain
  - The GEO and MODIS window channel IR temperatures are stable
- Convert the DCC radiance to an overhead sun radiance using the Hu BRDF model
- Apply an spectral band adjustment factor to the Aqua-MODIS sensor radiance to convert the radiance to an equivalent GEO sensor radiance using SCIAMACHY hyper-spectral radiances.
  - very small factor for wavelengths $<1\mu m$
- Histogram all of the pixel level DCC overhead sun radiances and determine the PDF mode radiance.
- Compute the GEO calibration coefficients by monitoring the drift of the monthly GEO PDF mode radiances, which represents the visible degradation of the sensor

VIIRS I1 (0.65μm) DCC mode radiances



- The VIIRS I1 band NASA LandPeate calibrated radiances seem stable over time
- The PDF mode has a smaller standard error than the mean

MODIS and VIIRS DCC mode radiance comparison

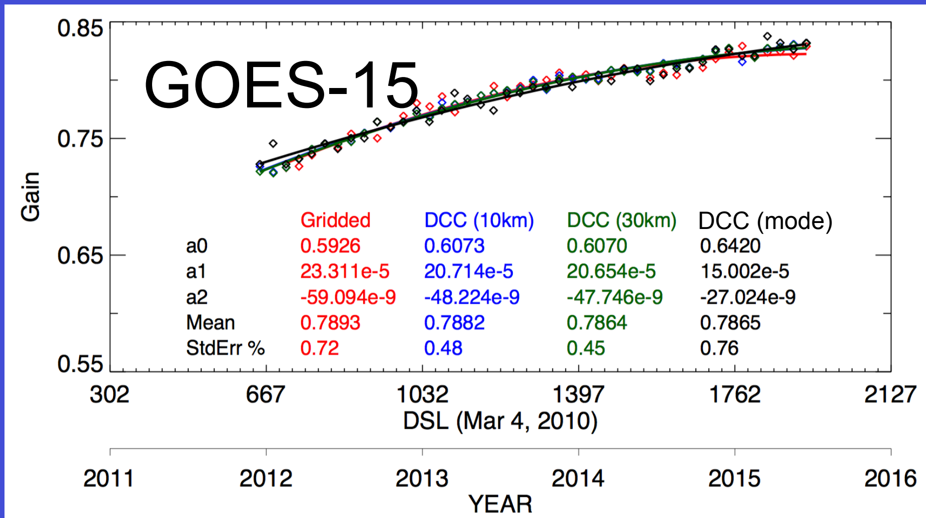


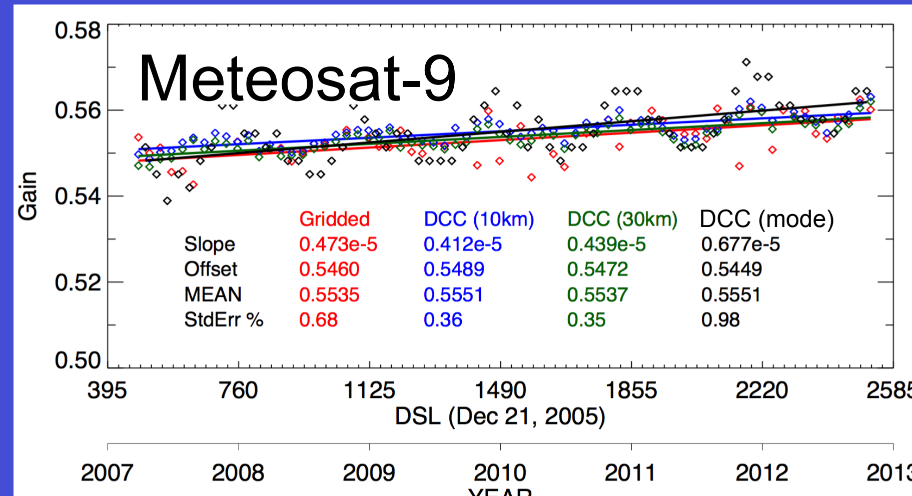
DCC Invariant target methodology (absolute calibration)

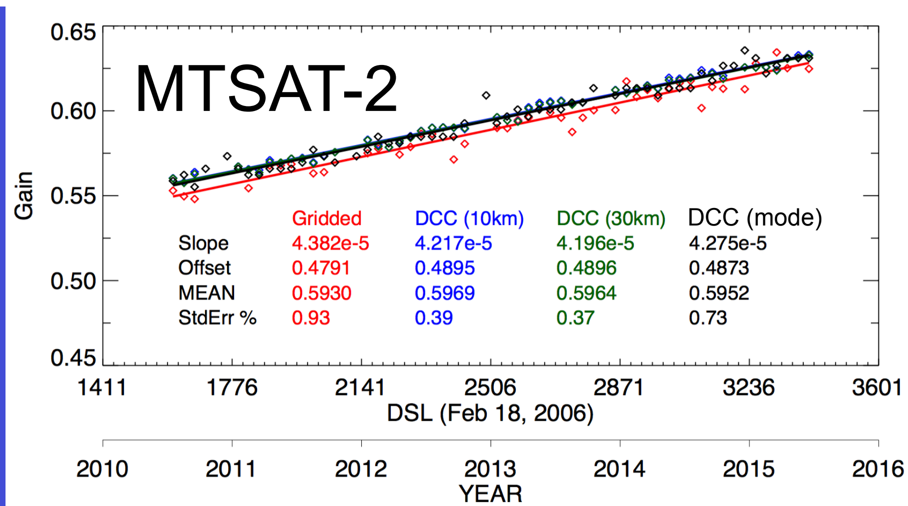
- Assume that the GEO (monitored) sensor and Aqua-MODIS (reference calibration) sensor capture the same DCC over the GEO domain at the time of the Aqua-MODIS overpass
  – They need not to be coincident ray-matched radiance pairs
  – This reduces the uncertainty of the slight regional and diurnal DCC reflectance variations
  – This method does not need any contemporary Aqua-MODIS observations making it possible to calibrate historical GEOs referenced to the MODIS calibration
- Validate with GEO/Aqua-MODIS ray-matched calibration
  – Ray-match over both all-sky tropical ocean and DCC cores.
  – Consistency among all methods validates all methods

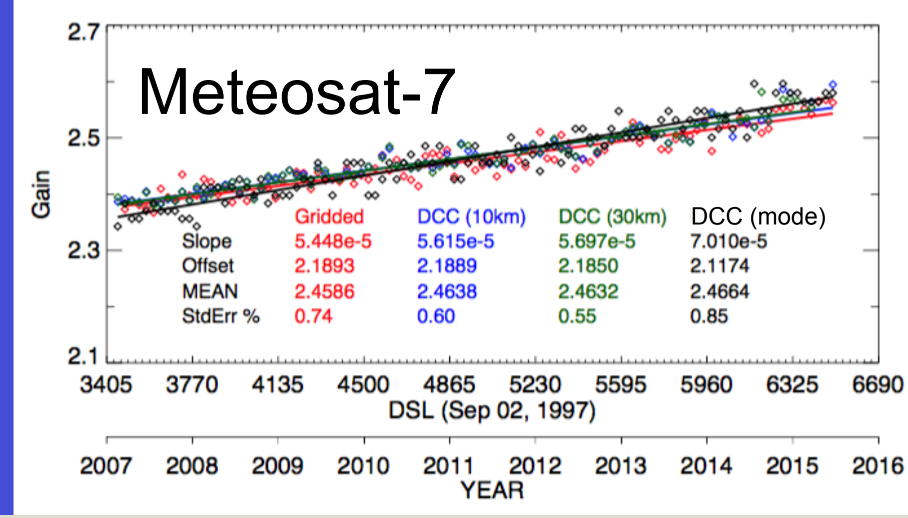
Doelling et al. 2016, in preparation

Comparison of all-sky tropical ocean ray-matching, DCC ray-matching and DCC invariant target approaches









- All calibration methods are within 0.4%, except for MTSAT-2 at 0.7%
- All DCC calibration methods are within 0.3%
- The DCC mode method has a larger standard error than DCC ray-matching

MODIS and VIIRS DCC mode 0.65µm radiance differences

%	MODIS-VIIRS M5	MODIS-VIIRS I1
Global	-0.7±0.5	1.3±0.4
GOES-W 135°W	-0.2±1.1	1.7±1.1
GOES-E 75°W	-0.4±0.6	1.6±0.5
Met-10 0°E	-0.7±0.8	1.2±0.7
Met-7 60°E	-0.5±1.2	1.4±0.9
FY2E 86°E	-1.1±0.8	1.0±0.8
MTSAT-2 140°E	-0.9±1.0	1.0±1.0

- The various GEO domains are within ±0.5% of the global MODIS and VIIRS difference, which is within the uncertainty of the method.
- The DCC mode radiance is able to capture the calibration difference between MODIS and VIIRS
- This allows the DCC mode to transfer the reference calibration to other sensors and need not be contemporary and can be applied historically

GEO IMAGE QC

GEO image QC

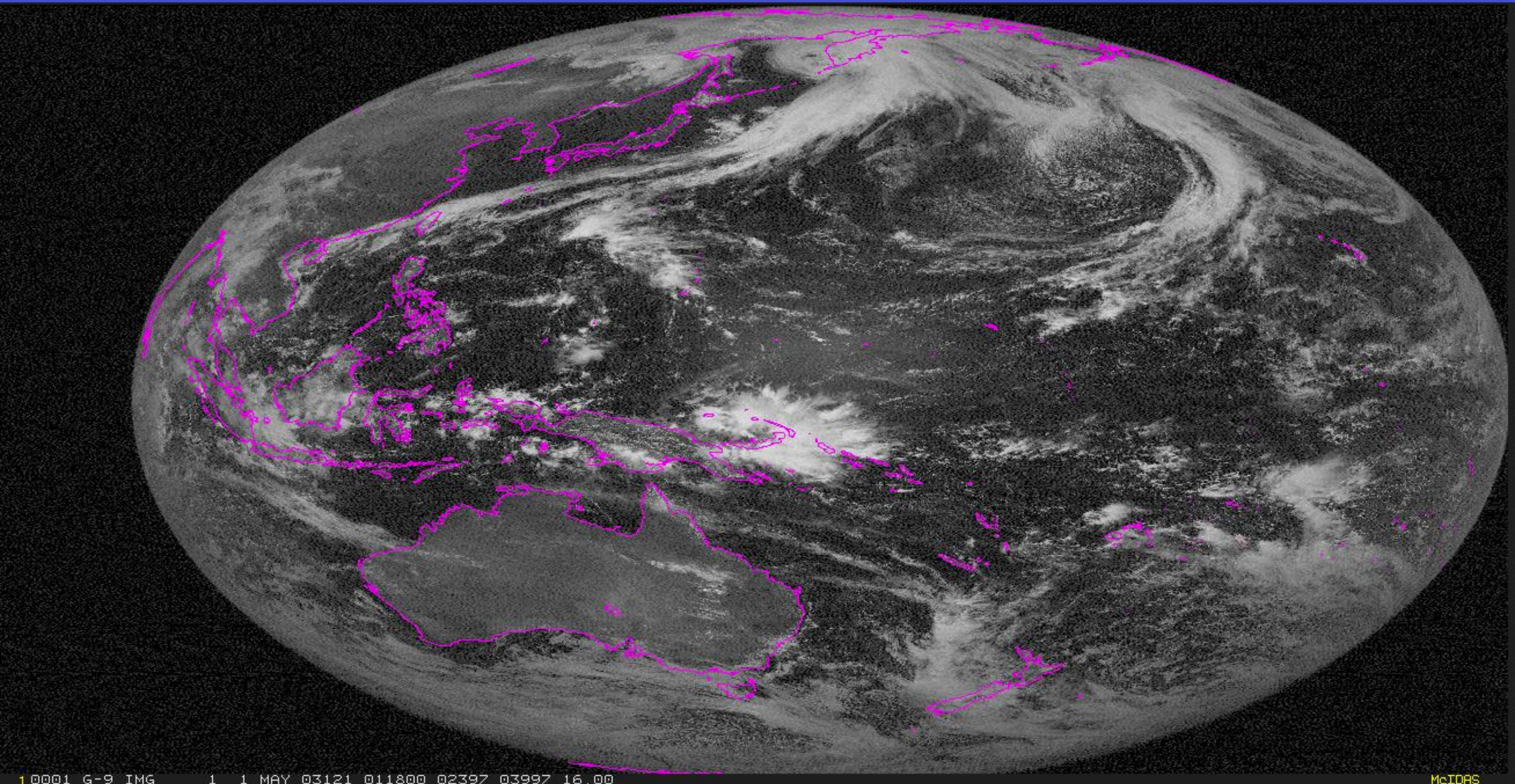
- GEO image quality control performed by automated bad scan line detection program and human bad scan line removal algorithm
  - Ed4 has 7 times the number of GEO images than Ed3
  - Ed3 post 2012 GEO image quality control performed by humans
  - Ed3 pre 2012 no GEO image quality control
- GEO 0.65, 3.7, 6.7, 11, 12 µm channels cleaned
- 5 cleaners, Igor Antropov, Bob Arduini, Jenny Chen, Sharon Gibson, Dennis Keyes, Pam Mlynczak,
- Geo processing, Michele Nordeen, Doug Spangenburg

Ed4 GEO image QC schedule

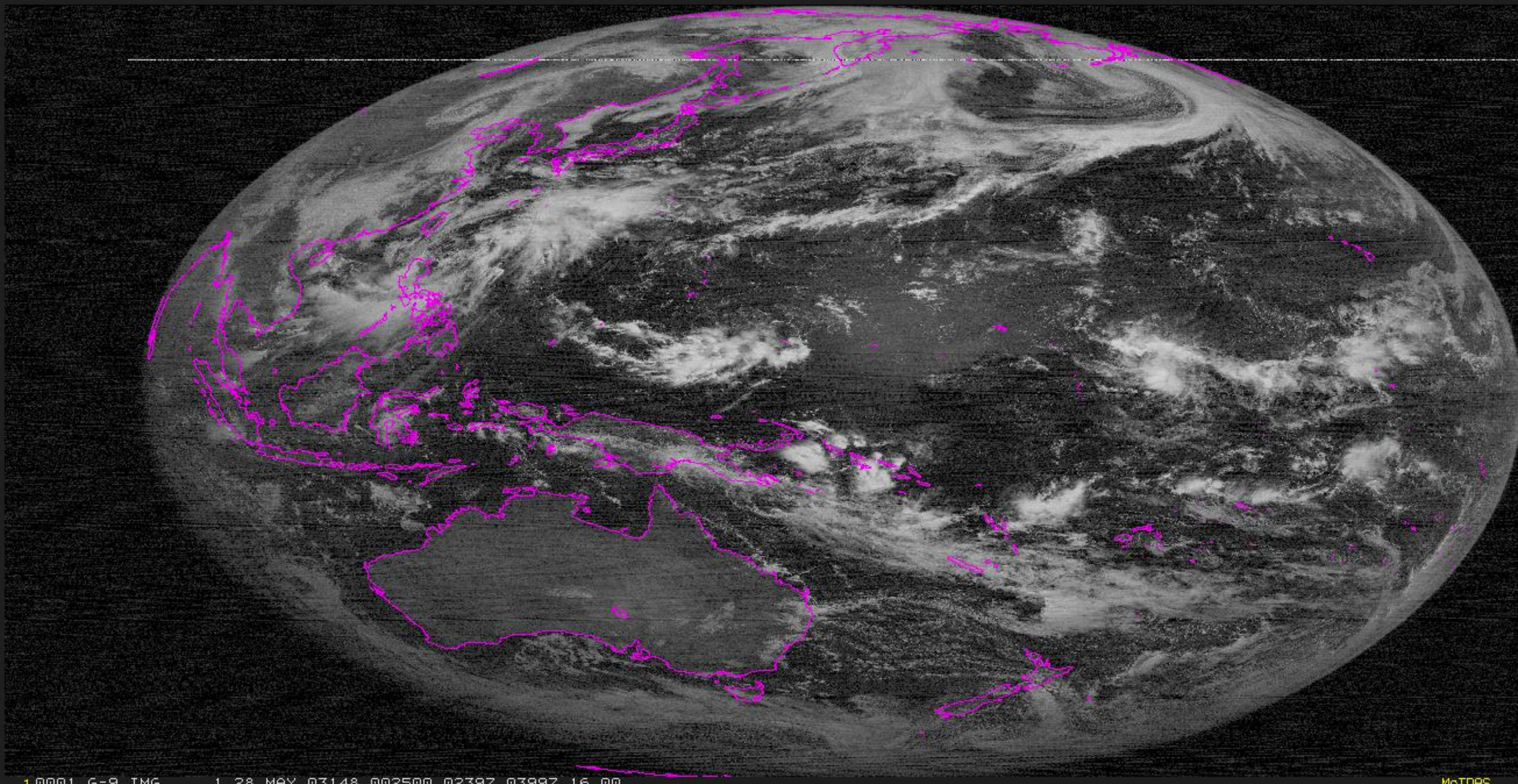
- GGEO grid is being processed at 6 months/week
- 2001 to 2015.5 is finished, 2000 is left, should be finished by first week of May
- I still need to validate a few years to check for undetected stray light before approval
- GGEO cleaning is validated by looking at the SYN1deg results, very few out of range values

- Next: GEO anomalies highlighting electronic interference patterns

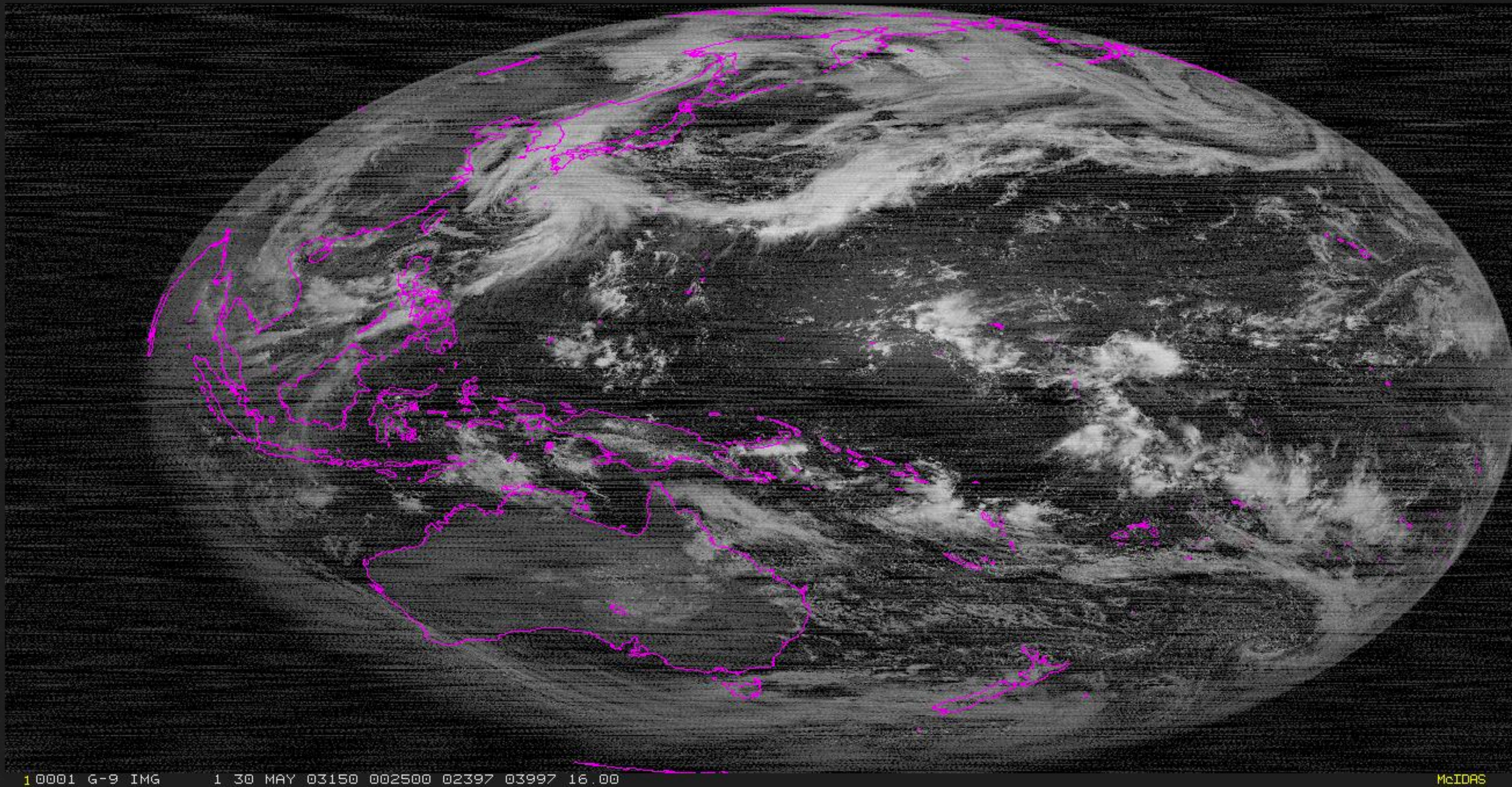
GOES-9, May 1, 2003, 1:18 GMT, visible image



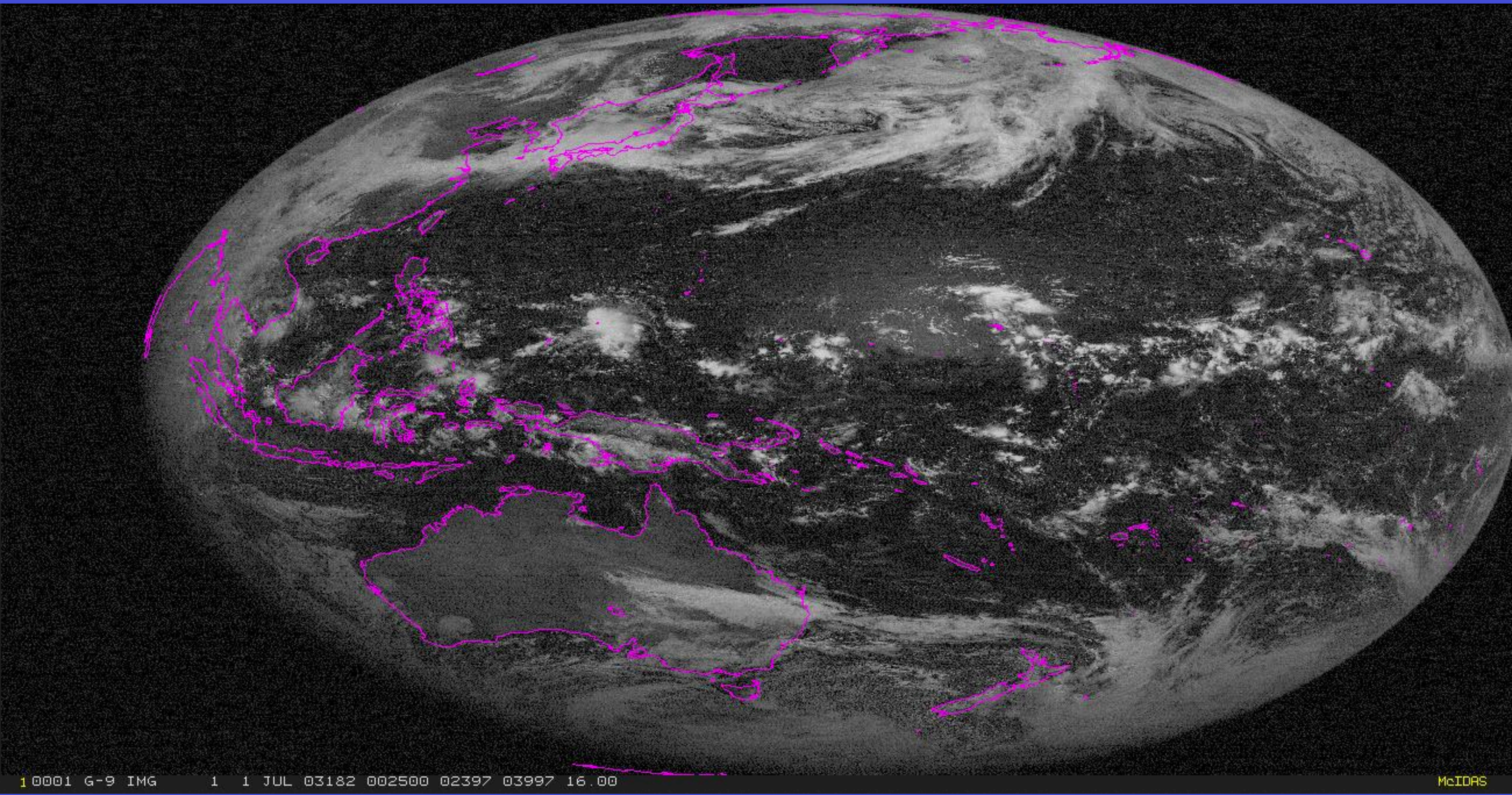
GOES-9, May 28, 2003, 2:50 GMT, visible image



GOES-9, May 30, 2003, 2:50 GMT, visible image

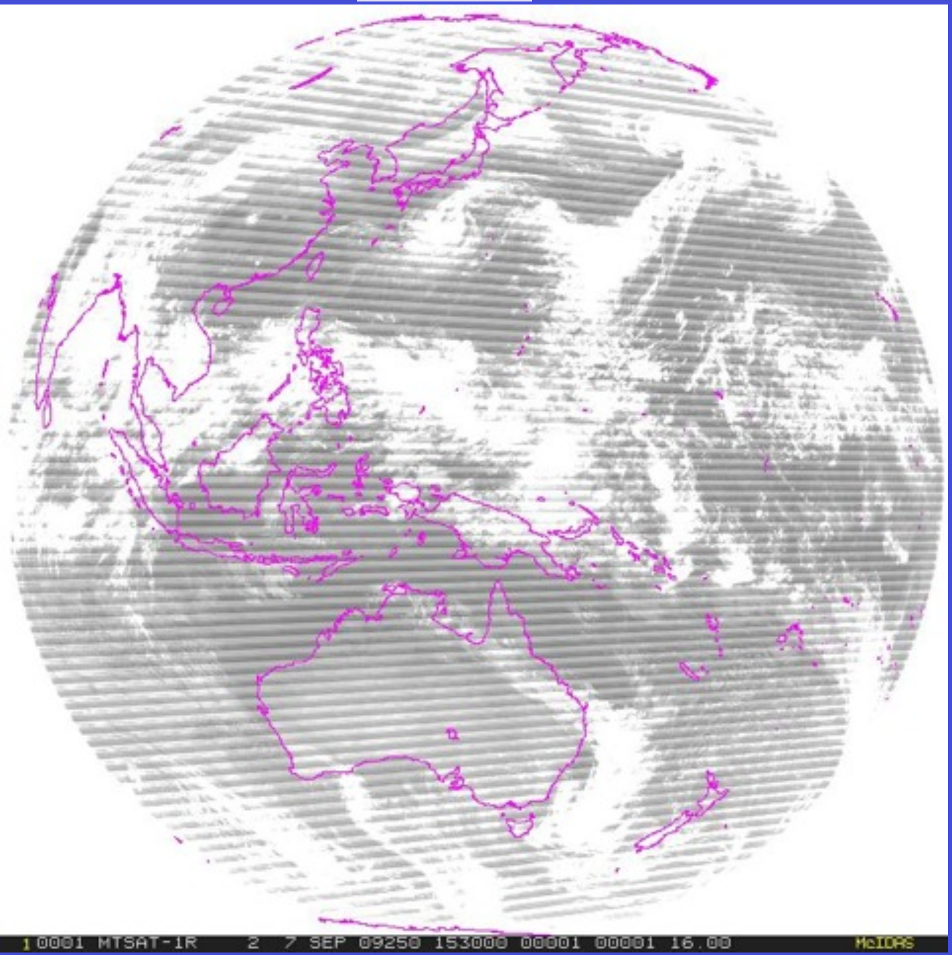


GOES-9, July 1, 2003, 2:50 GMT, visible image

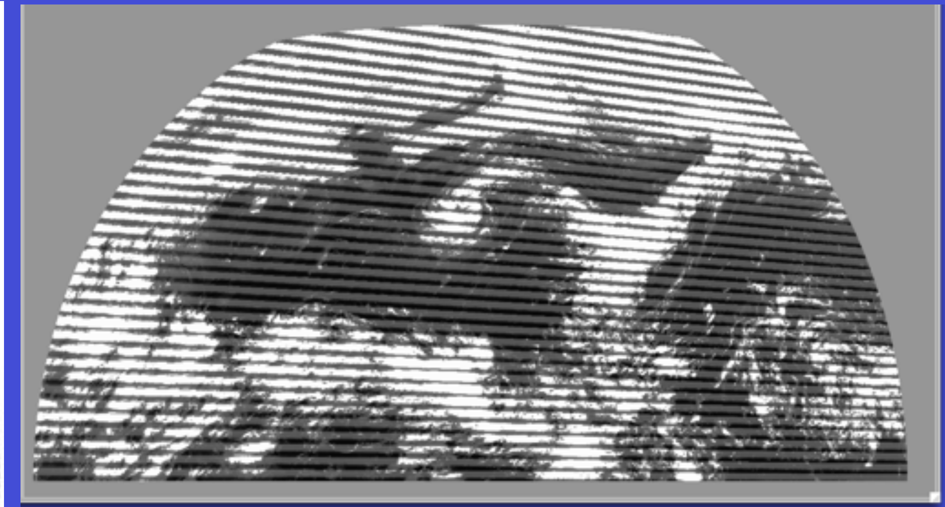


MTSAT-1R, Sept 7, 2009, 15:30GMT

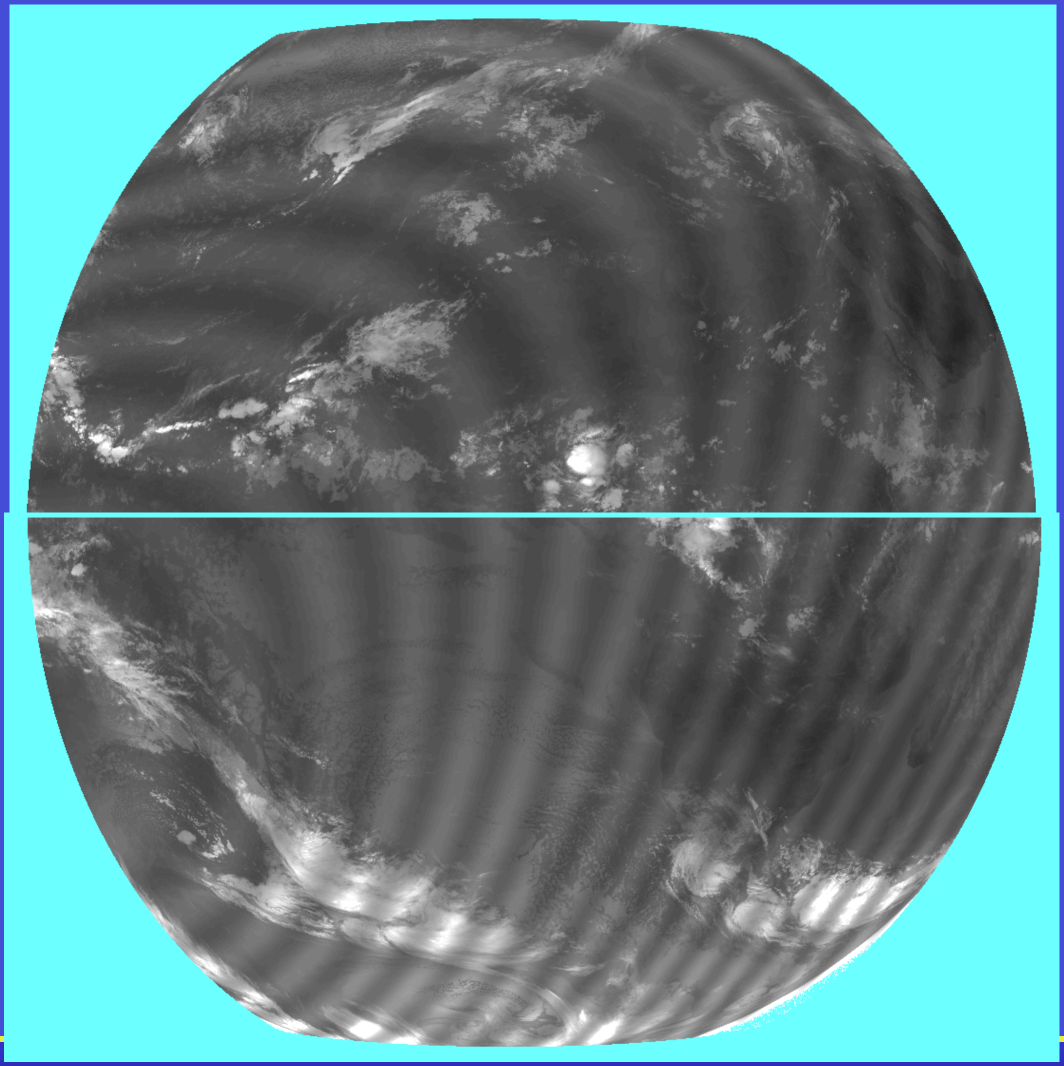
3.7μm



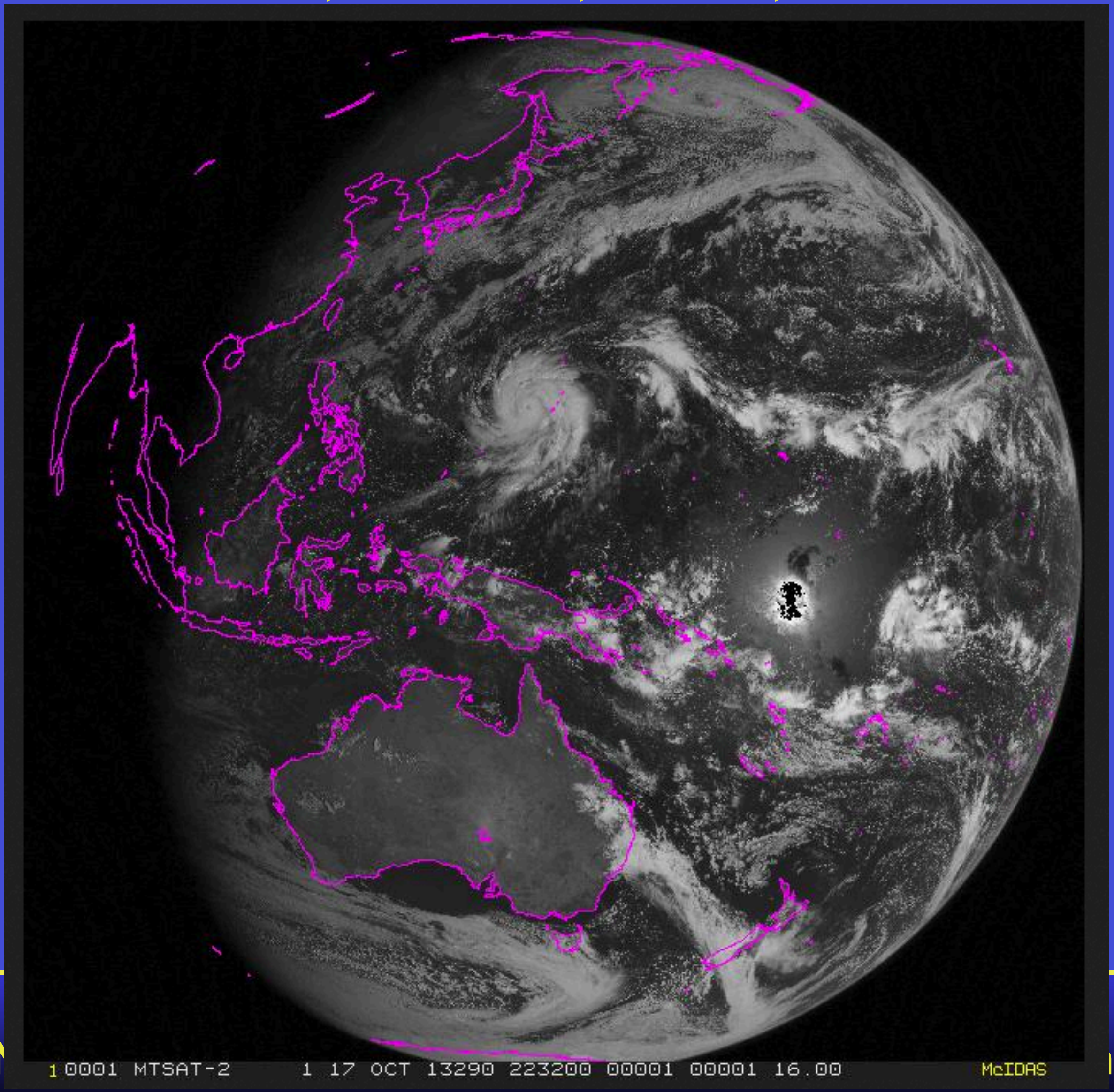
12μm



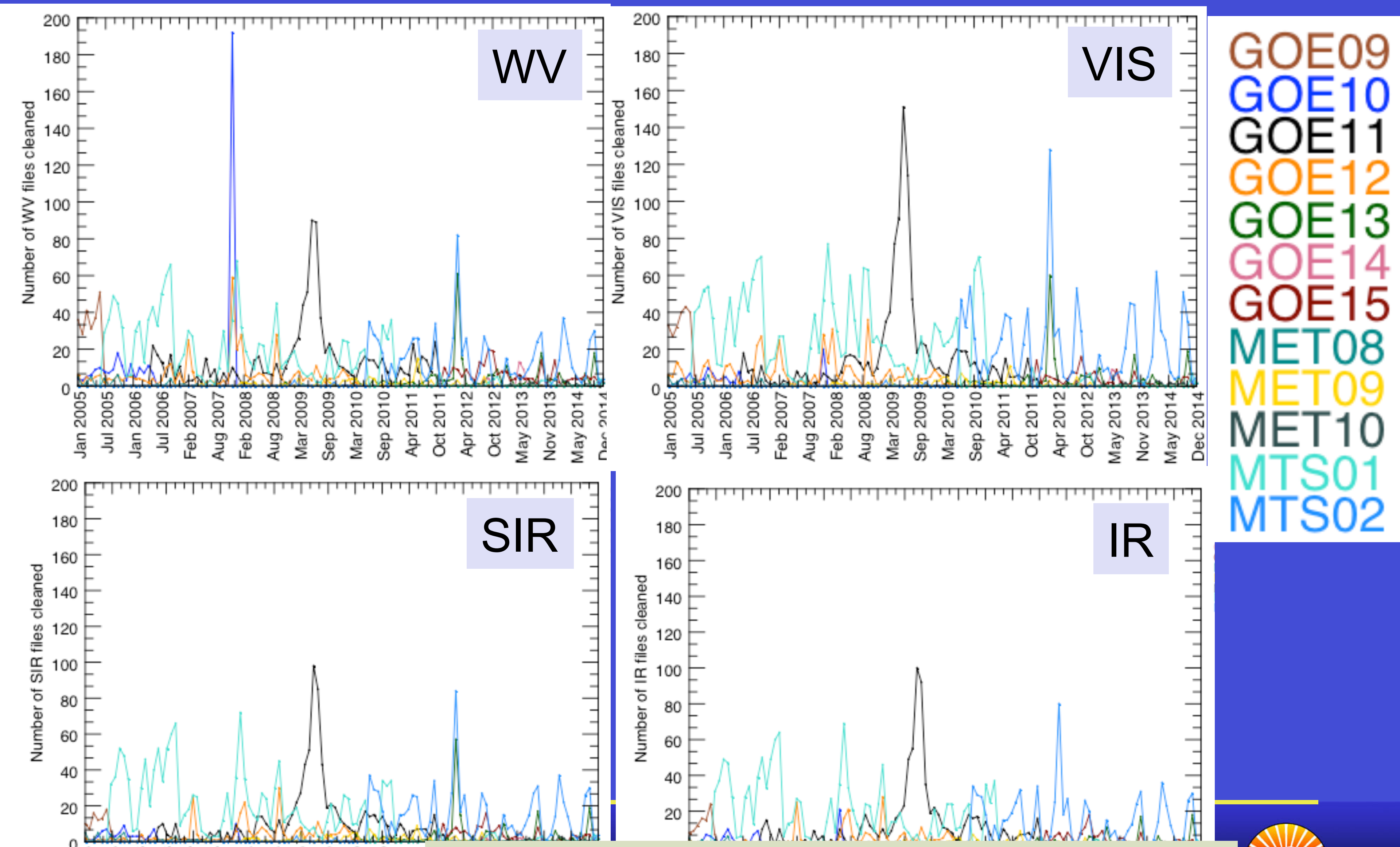
Met-8 Oct 7, 2004, 7:00 GMT, IR image



Saturated Sunglint in visible image
MTSAT-2, Oct 17, 2013, 22:32 GMT



of GEO images with bad scan lines



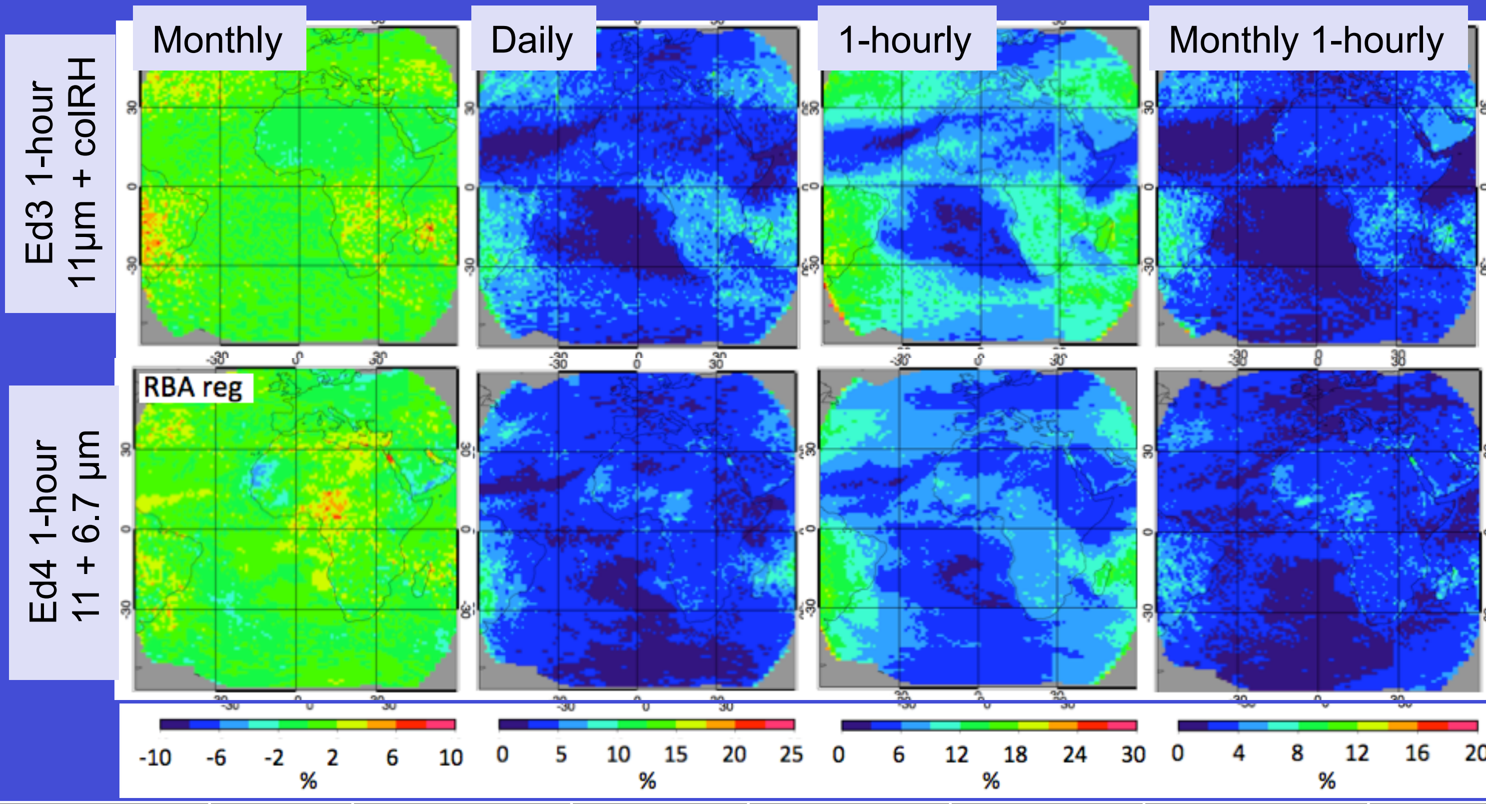
- MTSAT-1 and MTSAT-2 have most of the bad images
- Later GEOs have less bad scan lines

SW NB to BB

TISA Ed4 improvements

	Edition 3	Edition 4
GEO Calibration	• Terra-MODIS Collection 5 reference • GEO/MODIS ray-matching	• Aqua-MODIS Collection 6 • GEO/MODIS ray-matching • Validate with DCC and deserts • SCIAMACHY spectral band adjustment factors (SBAF) • MTSAT-1R point spread function
GEO Clouds	• Visible & 11µm **2-channel cloud code** • Assumed particle sizes • Assume night time emissivity=1	• **4-channel cloud code** • 3.7µm GEO particle sizes • Emissivity based on 3.7, 11, and 12 µm
GEO LW flux	• Column weighted humidity RH and WN radiance to BB global parameterization • Instantaneous Normalization	• WN and WV radiance to BB flux • 5° by 5° LW regional normalization
GEO SW flux	• GEO visible->MODIS 0.65µm-> BB • CERES SW TRMM ADM • 5° by 5° SW regional normalization	• Same as Edition3
Temporal Interpolation	• **GEO 3-hr obs** (linear interpolation) • TRMM SW directional models	• **GEO 1-hr observations** (no interpolation)
Surface Fluxes	• GEOS 4.0/5.2 merged atmosphere • Untuned surface fluxes • 2-channel clouds, MODIS skinT	•GEOS 5.4 atmosphere •Untuned surface fluxes •4-channel clouds MODIS/GEO skinT

CERES+GEO LW minus GERB hourly fluxes, Jan 2010



%	Bias	Monthly RMS	Daily RMS	3-hour RMS	1-hour RMS	Monthly 3-hour	Monthly 1-hour
Ed3-3hour	0.23	0.81	1.87	3.45		1.61	
Ed3-1hour	0.19	0.53	1.85	3.26	3.61	1.03	1.20
Ed4-1hour	0.14	0.59	1.54	2.48	2.81	0.97	1.12

- With CERES regional flux normalization reduces the overall RMS errors
- Ed4 is an improvement over Ed3 for all temporal resolutions except monthly means

GEO SW Derived Broadband Fluxes Ed 2,3, and 4

- GEO visible radiance NB to BB conversion
  - Convert GEO visible radiance to MODIS band 1 (0.65µm) equivalent radiance using MODTRAN simulated radiances
  - Convert the MODIS equivalent radiance (0.65µm) to BB radiance using MODIS/CERES empirical models based on the SSF product.
  - Both conversion use GEO cloud fraction, optical depth, and phase
- Invert the GEO BB radiance to BB flux using the CERES TRMM based ADMs
  - Scene dependent models that use GEO cloud fraction, optical depth, and phase
- Normalize the GEO derived BB fluxes with the CERES measured flux
  - For each month regionally linearly regress the coincident within 30 minute GEO and CERES flux pairs over a 5°x5° latitude by longitude moving domain

GEO SW derived flux validation

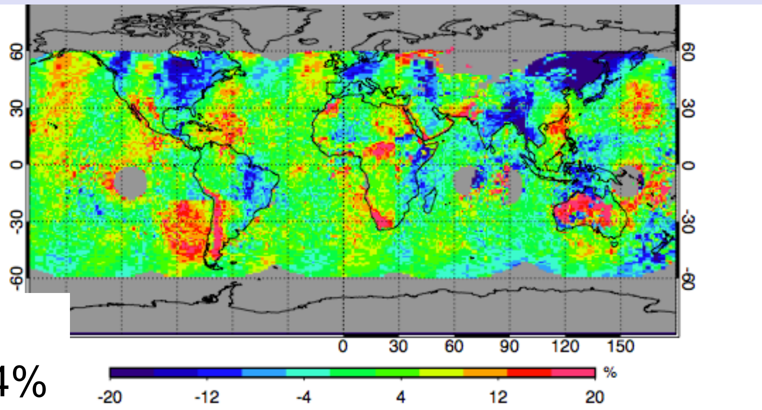
- Read in GEO clouds and radiances and place in appropriate hourboxes
  - Only difference is 1-hour vs 3-hourly GEO images
  - 4-channel and 2-channel cloud retrievals
- Interpolate GEO clouds and radiances for hourboxes with no observations
- Convert the GEO radiances to broadband flux using NB to BB coefficients and the CERES ADMs
- Normalize regionally with GEO derived fluxes with Aqua CERES measurements
- Compare the GEO derived fluxes with Terra observed fluxes and derive statistics

Jan 2010

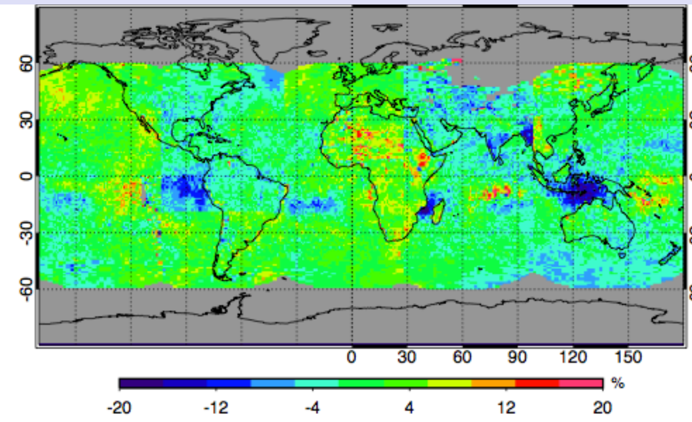
Ed3 3-HR, Diurnally Interp, No Norm

1-HR, No Interp, Normalization, **Ed4**

BIAS

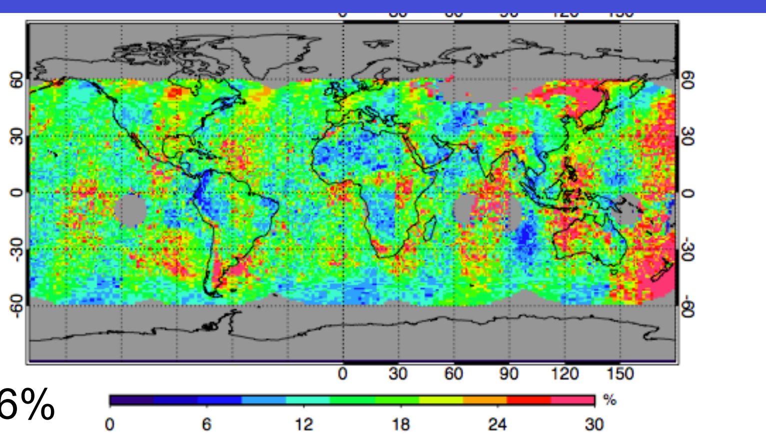


1.0%
σ=6.4%

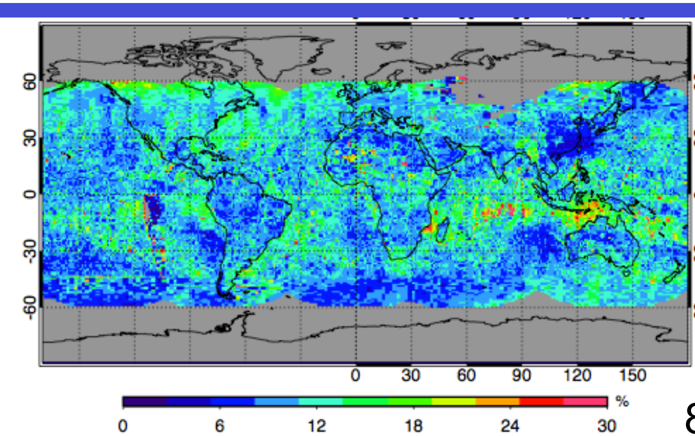


0.1%
σ=3.6%

RMS



13.6%



8.9%

- No change in GEO SW NB to BB procedure, just 1-hourly and 4-channel clouds

Edition 4 GEO derived SW flux improvement

Jan 2010 (%)	partial error	RMS error	Partial σ	σ
Ed 3 (with Ed4 clouds)		13.6	1	6.4
Interp/obs	1.5	12	1	5.4
3-hr to 1 hr	2	10	1	4.4
Normalization (Ed 4)	1	9	1	3.4

•No change in GEO SW NB to BB procedure, just 1-hourly and 4-channel clouds
• 1-hourly GEO data had the greatest impact on the RMS error
• All improvements had a similar impact on the regional standard deviation
• Need to isolate the cloud property contribution, process with 2-channel clouds and repeat analysis

Selection of GEO visible channels for conversion to broadband

- The WV channel was added with the IR window channel to improve the GEO derived fluxes in Ed4
  - Edition 3 used the GEOS 4/5 column weighted RH
  - All GEOs have a WV channel
  - Instead of blindly improving Edition 3 GEO derived SW flux approach, reexamine the channel selection
- Some of the new GEOs now have multiple visible channels
  - Himawari-8 and GOES-R have very similar channels to VIIRS and MODIS
- Perform MODIS visible channels to CERES broadband regressions
  - Select channels according to lowest RMS error
  - Select a combination of 1, 2, and 3-channels for clear-sky ocean and all-sky ocean

VIIRS, MODIS and GEO bands

		VIIRS			MODIS		GEO						
µm	Band	SSF Day	SSF Night	cloud	SSF Day	SSF Night	Hima wari	GOES ABI	MTG	MSG	Insat 3D	2nd	1st
0.49	M3	F			F		X	X	X				
0.56	M4	P			P		X		X				
0.67	M5												
0.64	I1	F		X	F		X	X	X	X	X	X	X
0.87	M7	F			F		X	X	X	X			
0.87	I2												
1.24	M8	P		X	P								
1.38	M9							X	X				
1.61	M10												
1.61	I3	P		X	PT		X	X	X	X	X		
2.25	M11	P			PA		X	X	X				
3.7	M12	P											
3.74	I4		F	X	P	P	X	X	X	X	X	X	
8.55	M14	P	F	X	P		X	X	X	X			
10.8	M15	F	F	X	F		X	X	X	X	X	X	X
11.5	I5		F										
12.0	M16	F	F	X	F		X	X	X	X	X	X	
6.7	WV				P	F	X	X	X	X	X	X	X

F=CERES footprint, total, clear and layers
P=CERES footprint, total and clear

Aqua-MODIS visible band to CERES SW ocean CLEAR-SKY radiance conversion

channel	RMS error
0.47	3.5
0.55	3.0
0.65	2.7
0.86	3.2
0.91	3.3
1.24	4.1
2.13	5.0
3.8	>7.0

- As predicted the 0.65µm has the lowest RMS error for one channel.
- The GEO 0.65µm was used for Ed3 NB to BB conversion

Aqua-MODIS visible band to CERES SW ocean CLEAR-SKY radiance conversion

channel	RMS error
0.47	3.5
0.55	3.0
0.65	2.7
0.86	3.2
0.91	3.3
1.24	4.1
2.13	5.0
3.8	>7.0

channel	RMS error
0.47/0.65	2.31
0.47/0.86	2.21
0.47/0.91	2.25
0.55/0.86	2.33
0.55/0.91	2.36
0.65/0.86	2.38
0.65/0.91	2.40
0.65/1.24	2.43

- As predicted the 0.65µm has the lowest RMS error for one channel.
- The blue and 0.86µm channels are best for two channels

Aqua-MODIS visible band to CERES SW ocean CLEAR-SKY radiance conversion

channel	RMS error
0.47	3.5
0.55	3.0
0.65	2.7
0.86	3.2
0.91	3.3
1.24	4.1
2.13	5.0
3.8	>7.0

channel	RMS error
0.47/0.65	2.31
0.47/0.86	2.21
0.47/0.91	2.25
0.55/0.86	2.33
0.55/0.91	2.36
0.65/0.86	2.38
0.65/0.91	2.40
0.65/1.24	2.43

channel	RMS error
0.47/0.55/0.91	2.09
0.47/0.55/0.86	2.06
0.47/0.65/0.86	2.06
0.47/0.65/0.91	2.08
0.47/0.65/1.24	2.10
0.47/0.86/2.13	2.17
0.47/0.86/1.24	2.09
0.47/0.86/2.13	2.10
0.65/0.86/3.8	2.13 to 2.15

- As predicted the 0.65μm has the lowest RMS error for one channel.
- The blue and 0.86μm channels are best for two channels
- Adding either the green or the red channel is best for 3-channels

Aqua-MODIS visible band to CERES SW ocean ALL-SKY radiance conversion

channel	RMS error
0.47	11.2
0.55	10.8
0.65	10.3
0.86	11.7
0.91	13.8
1.24	17.6
2.13	>48

- As predicted the 0.65µm has the lowest RMS error for one channel.

Aqua-MODIS visible band to CERES SW ocean ALL-SKY radiance conversion

channel	RMS error
0.47	11.2
0.55	10.8
0.65	10.3
0.86	11.7
0.91	13.8
1.24	17.6
2.13	>48

IR = 8.6,11,12

channel	RMS error
0.65/0.47	9.65
0.65/0.55	9.42
0.65/0.86	9.61
0.65/0.91	9.06
0.65/1.24	9.14
0.65/2.13	8.72
0.65/3.8	8.96
0.65/6.7	9.27
0.65/IR	8.64-8.68

- As predicted the 0.65µm has the lowest RMS error for one channel.
- The 0.65µm and IR channels are best for two channels
- Note the 9.06µm channel is close to the IR channel, since it is a NIR water vapor absorption band.

Aqua-MODIS visible band to CERES SW ocean ALL-SKY radiance conversion

channel	RMS error
0.47	11.2
0.55	10.8
0.65	10.3
0.86	11.7
0.91	13.8
1.24	17.6
2.13	>48

IR = 8.6,11,12

channel	RMS error
0.65/0.47	9.65
0.65/0.55	9.42
0.65/0.86	9.61
0.65/0.91	9.06
0.65/1.24	9.14
0.65/2.13	8.72
0.65/3.8	8.96
0.65/6.7	9.27
0.65/IR	8.64-8.68

channel	RMS error
0.47/0.91/2.13 or 3.8	7.62-7.69
0.47/0.91/IR	7.86-7.91
0.47/1.24/IR	7.62-7.64
0.47/2.13/IR	7.53-7.56
0.55/0.65/IR	7.87-7.90
0.55/1.24/IR	7.66-7.68
0.55/2.13/IR	7.46-7.50
0.65/1.24/IR	7.53-7.54
0.65/2.13/IR	7.22-7.24

- As predicted the 0.65µm has the lowest RMS error for one channel.
- The 0.65µm and IR channels are best for two channels
- Adding the 2.13µm is best for 3-channels
- **For Edition 5, use the 0.65µm and IR channels, since every GEO has these channels**
- Likely different for land types
- Also look into converting visible channels directly into broadband flux, similar to LW

GEO and MODIS cloud impact on CERES ADM selection

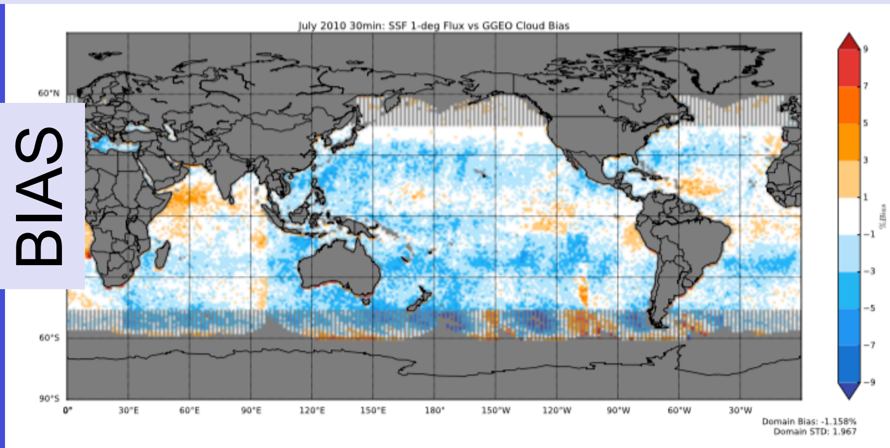
- 80% of all SYN1deg hourbox fluxes are GEO derived fluxes
  - GEO Ed4 clouds are used to convert the GEO BB radiance to the BB flux
- Compare at the CERES measurement within 30 minutes the GEO derived flux and the CERES observed flux
  - Only over non-glint ocean
- CERES observed flux is based on SSF footprint (20^2-km) regional average
  - GEO is based on a single scene ADM for the region ~100^2-km
  - Also compare the MODIS single scene ADM for the region to the SSF footprint averaged flux
- TISA uses the TRMM ADMs for all Editions, whereas SSF uses the Ed4 Terra/Aqua RAPS mode ADMs

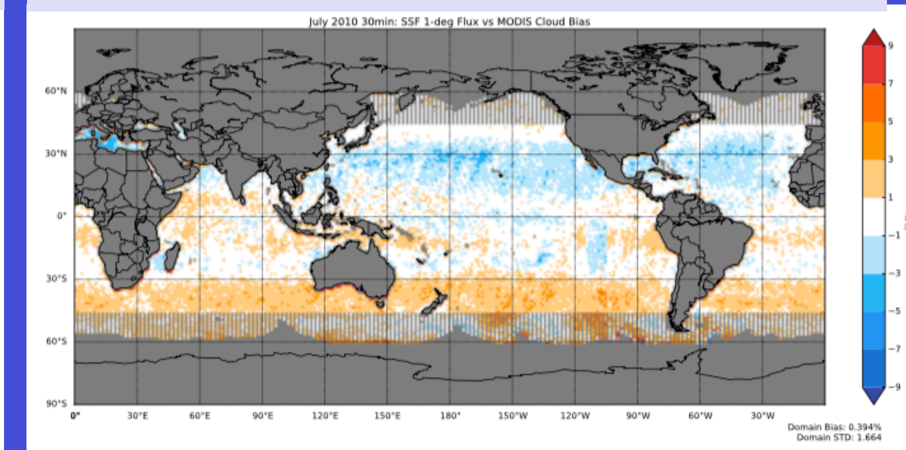
July 2010, preliminary

CERES radiance and GEO Ed4 clouds

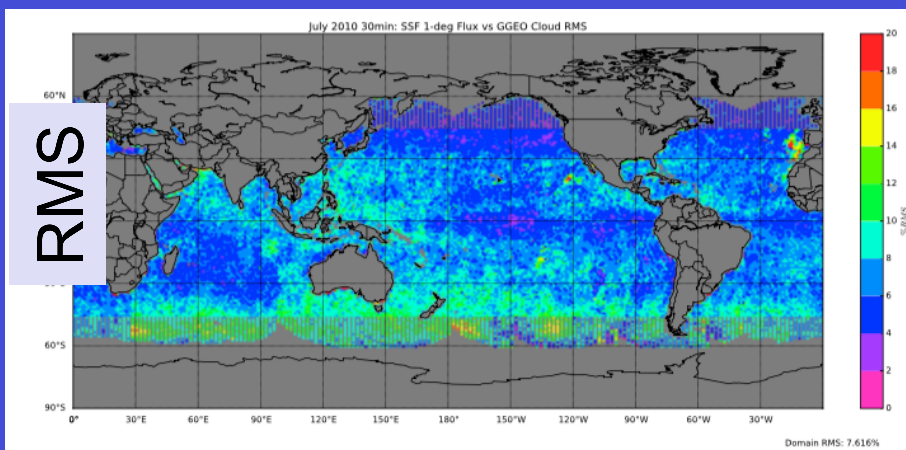
CERES radiance and MODIS clouds

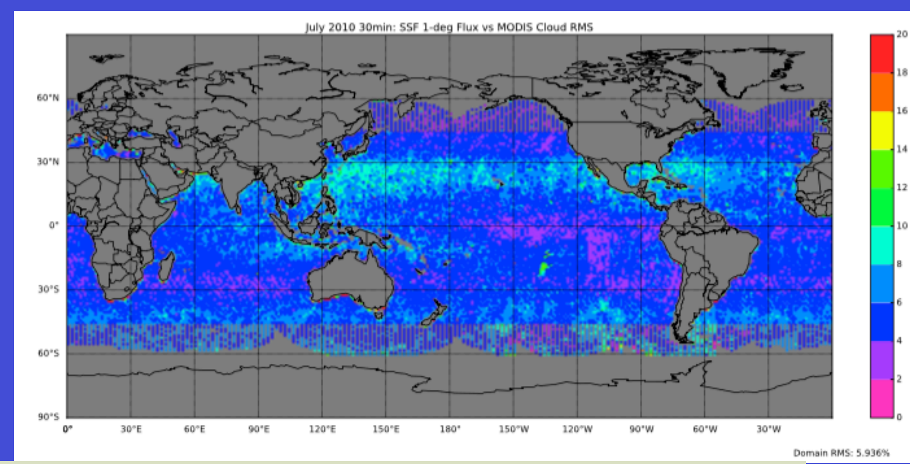
BIAS





RMS





- The MODIS clouds show a distinct bias with the SSF footprint averaged flux
- The RMS error is much smaller for the MODIS clouds

GEO/MODIS cloud impact on ADM, preliminary

	GEO clouds		MODIS clouds	
%	Jan 2010	July 2010	Jan 2010	July 2010
Reg Sdev	1.6	2.0	1.9	1.7
RMS error	7.3	7.6	6.0	6.0

• Need to isolate the TRMM vs the Ed4 Terra/Aqua RAPS ADM
Apply TRMM ADM to the SSF footprint fluxes and compare to the Ed4 SSF fluxes

• Need to isolate the footprint (20km) vs regional (100km) TRMM ADM application
May need to weight by the ADM radiance the individual 4-layer cloud properties

• Find the TRMM ADM difference between 2-channel and 4-channel GEO clouds

• May try GEO cloud property normalization with MODIS, if there nothing else to do.

TISA Products

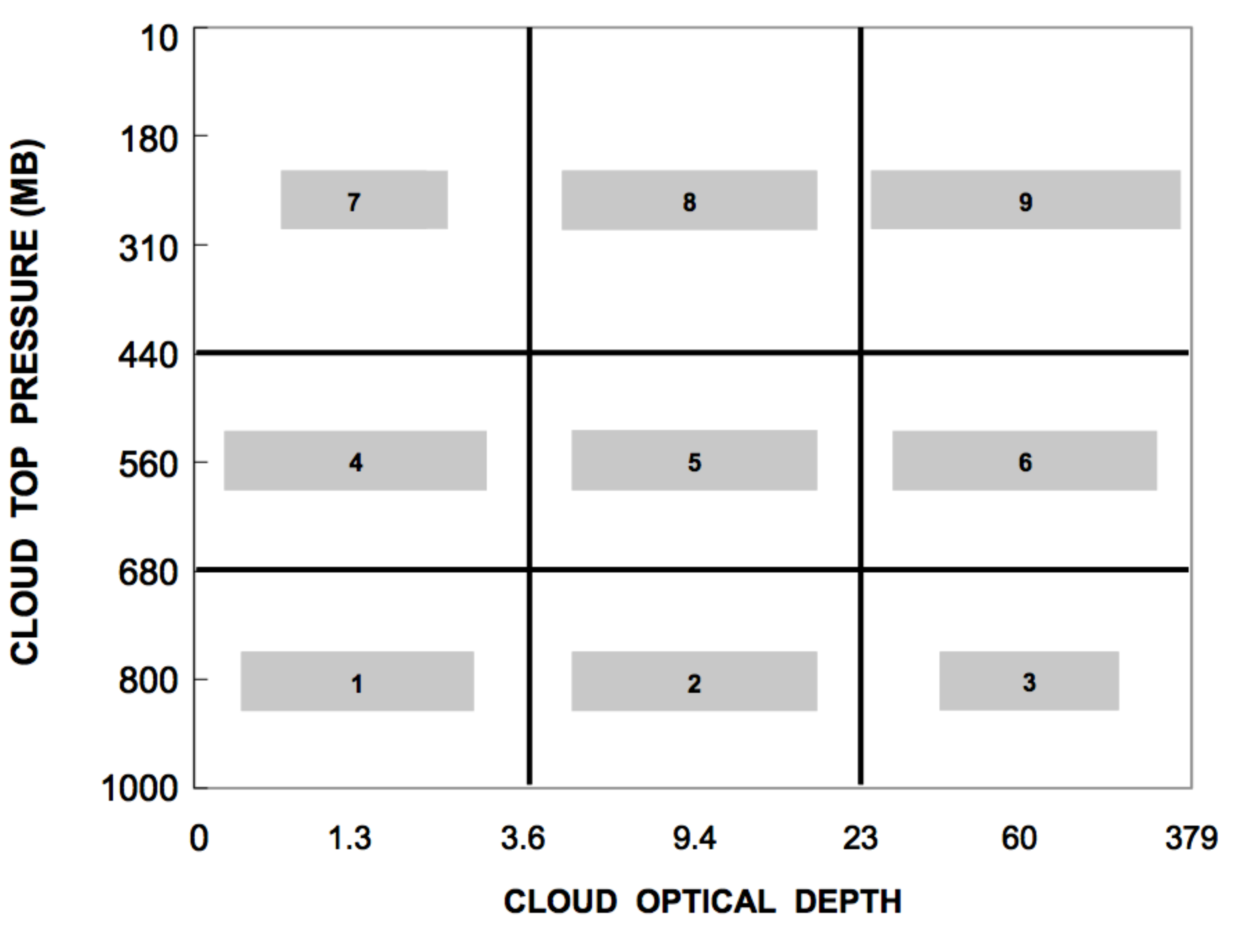
TISA Edition 4 deliveries

- GGEO grid is being processed at 6 months/week
  - Completed 2001 to 2015.5, 2000 is left, should finish by first week of May
- SSF1deg
  - Processed Mar. 2000 to Nov 2014
- SYN1deg
  - Bug found in TSI and SYN1deg code, some clear-sky zonal fluxes erroneously default, and GEO data outside of ±60° in latitude was not normalized correctly
  - 2005-2011 SYNI processed, processes at 1 week per year using all resources
- SSF1deg-lite, and SYN1deg-lite all-sky is incorporated in EBAF code
  - Lite codes are now GMT based
  - Lite codes consistent with full parameter codes
- Clear-sky EBAF codes
  - Clear-sky weighting incorporated, replace erroneous all-sky directional model with TRMM clear-sky model, MODIS clear-sky fluxes incorporated into TISA averaging

TISA Edition 4 deliveries

- CldTypHist delivered, previously known as ISCCP-D2like
  - Combined MODIS and GEO monthly hourly and monthly cloud properties stratified by optical depth and pressure
  - Validate with the SYN1deg-Mhour and monthly dataset
- FluxByCloudTyp product to be delivered shortly
  - Instantaneous gridded CERES fluxes by cloud type as in CldTypHist, based on sub-footprint MODIS derived broadband fluxes
  - Develop new product format, that does not complex indexing

CldTypHist cloud classification



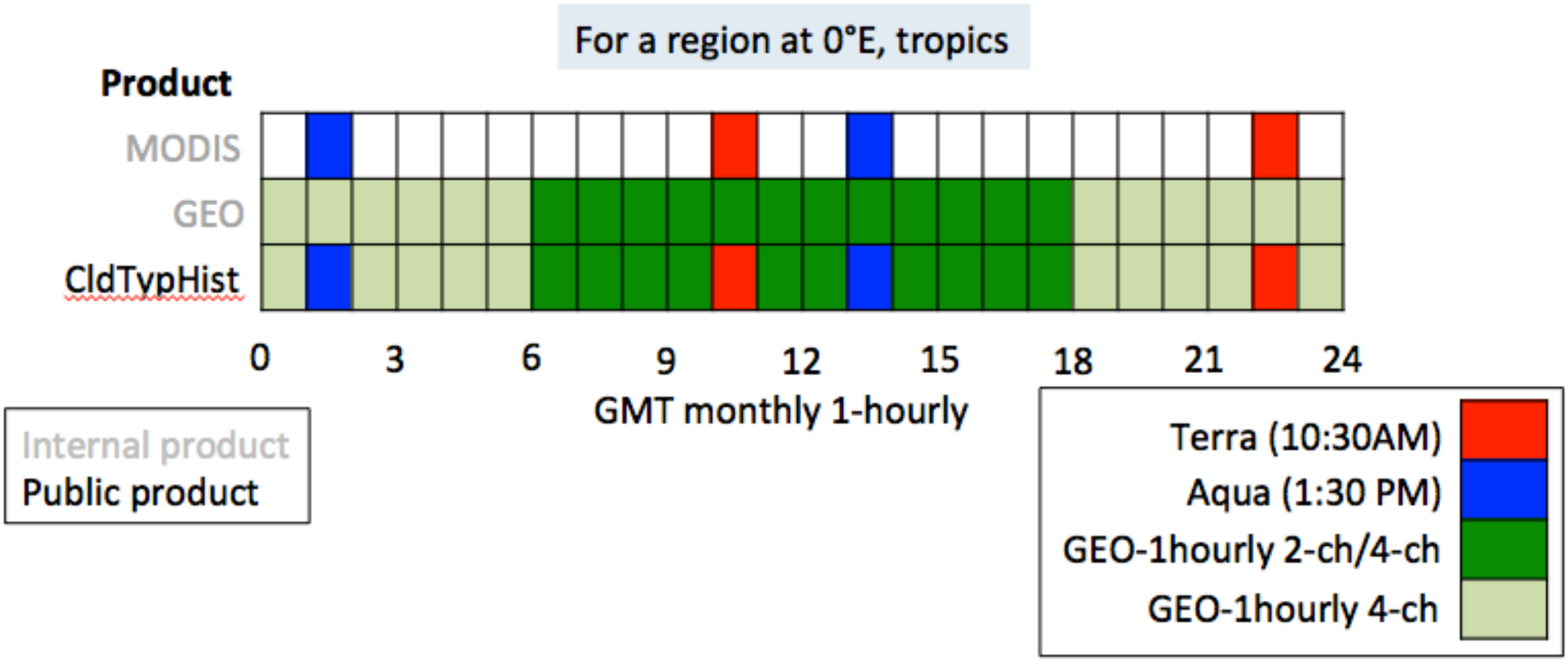
- Same as the ISCCP cloud classification

CldTypHist cloud properties

Parameter	MODIS Day/ night	GEO 4-ch Day/night	GEO 2-ch day	GEO 2-ch night
Cloud fraction	X	X	X	X
Effective Pressure	X	X	X	X
Effective Temperature	X	X	X	X
Effective Height	X	X		
Top Pressure	X	X		
Top Temperature	X	X		
Top Height	X	X		
Optical Depth	X	X	X	
LWP/IWP	X	X		
Ice/Liq Particle Size	X	X		
Cloud Emissivity	X	X		

X Same as Edition 3
X New for Edition 4

CldTypHist Ed4 products



- 4-channel GEO pixel-level cloud code does not require the use of the gamma function to distribute pressure layer optical depth into optical depth bins as does the 2-channel GEO layer-level cloud code, no 2-channel GEO clouds available at night.
- MODIS cloud properties take precedence over GEO. Number of MODIS and GEO measurements available at the monthly hourly temporal resolution. The Terra and Aqua-MODIS cloud properties should be very similar for Edition 4

Validation of CldTypHist and SYN1deg

CldTypHist processing

SSF footprint level | GEO pixel level

Grid into 3x3x2 cloud types and region

Monthly hourly cloud types
Merge hourly Terra, Aqua, GEO
No temporal interpolation

Monthly mean cloud types and total cloud

SYN1deg processing

SSF footprint level | GEO pixel level

SSF1deg-hour
4 layer and region

GGEO gridded
4 layer and region

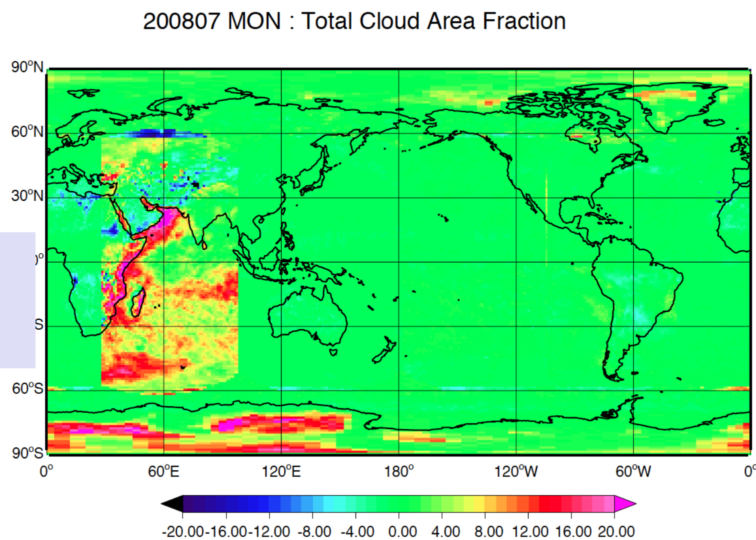
TSI, merge hourly Terra, Aqua, GEO
Temporally interpolate data gaps

SYN1deg, monthly means

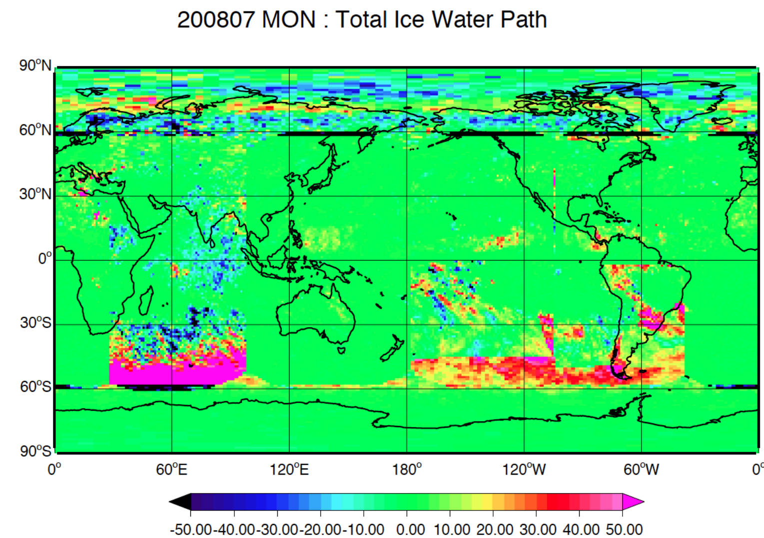
CldTypHist monthly means~SYN1deg monthly means

Total cloud Fraction: CldTypHist_Ed4 - SYN1Deg Monthly Hourly July 2008

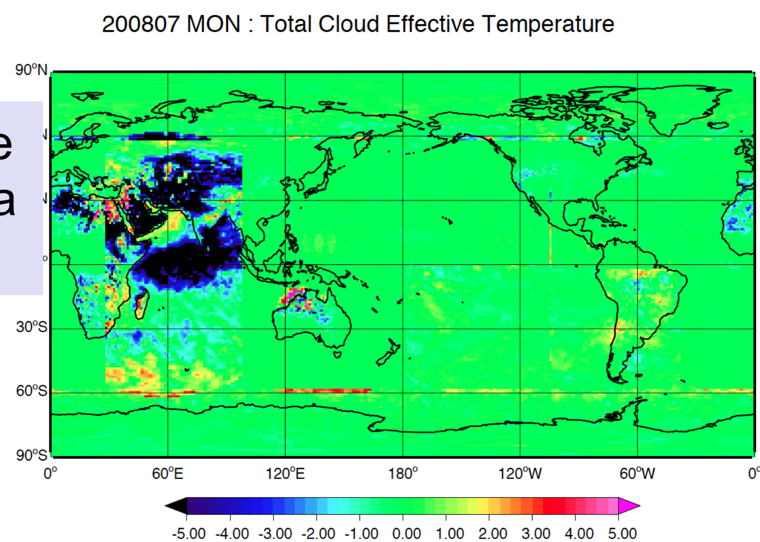
Cloud Fraction



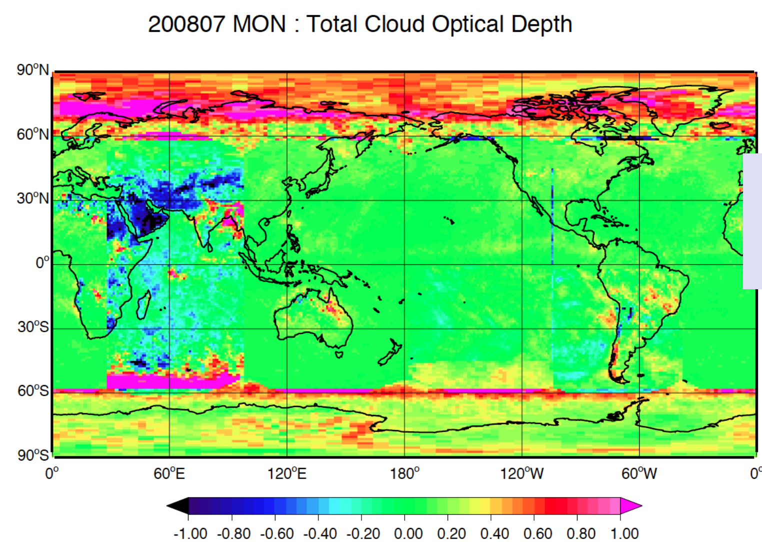
IWP



Effective Tempera ture



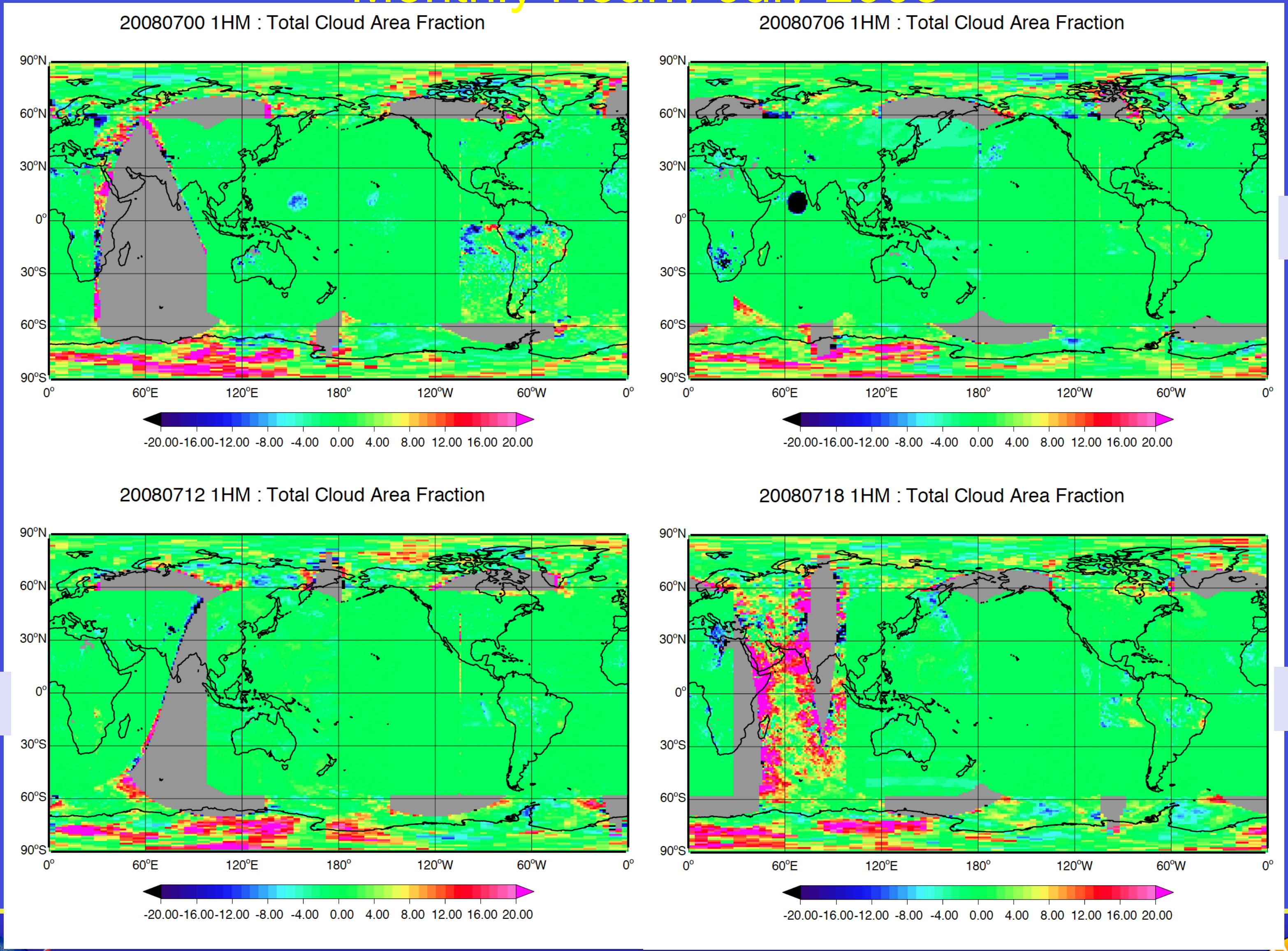
Optical depth



Total cloud Fraction: CldTypHist_Ed4 - SYN1Deg Monthly Hourly July 2008

Hr 00

Hr 06



Hr 12

Hr 18

TISA Future Efforts

- Write Edition 4 GEO calibration paper, which uses Aqua-MODIS as the reference calibration
- Seamlessly transfer the GEO calibration reference from Aqua-MODIS to NPP-VIIRS
- Write SSF1deg, SYN1deg, CldTypHist DQS
- Deliver the Fluxbycldtyp code
- Improve the GEO SW narrowband to broadband fluxes
- Improve the TISA code robustness, modularization and scalability for Edition 5